

Observation Networks in the Arctic

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Introduction

This study provides a review of the current meta data available on the surface and upper air observation networks in the Arctic. To define the Arctic boundary for the purpose of this study, we used the 50° N Latitude and the Arctic Catchment Area defined by Vorosmarty, et al (1996). The 50° N Latitude provides a quick and simple boundary to separate stations in large global data sets. The Vorosmarty boundary provides a more refined boundary based on the major watersheds making up the Arctic Basin (See Figure 1).

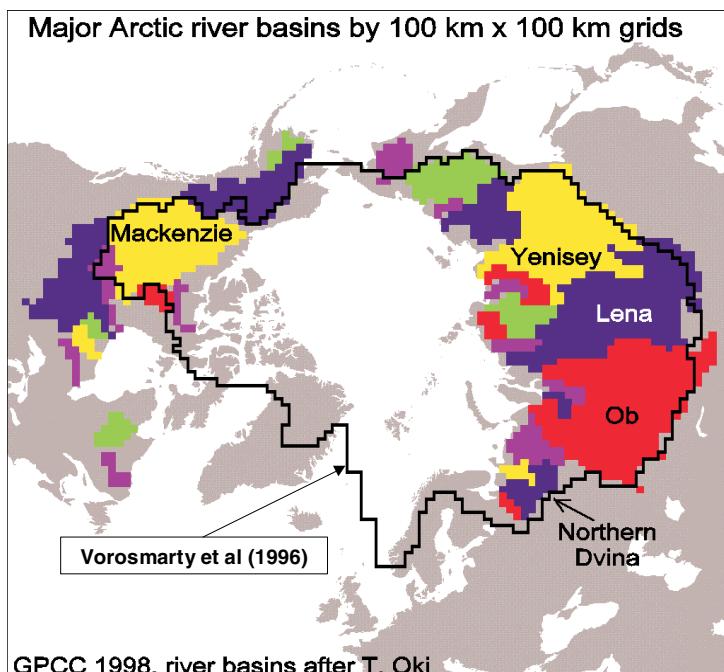


Figure 1. Major Arctic Rive Basins (from GPCC Website)

Meta Data Sources

The two most comprehensive meta data sources providing listings of global data sets that includes the Arctic region are:

1. WMO Publication No. 9: Weather Reporting and Regional Basic Synoptic Networks-- Volume A: Master File of Observing Stations, and
2. GPCC--ACSYS-APDA Data Catalogue.

WMO Publication No. 9 Volume A - *Observing Stations* contains a complete list of the **active** surface and upper-air weather observing stations in operation which are used for synoptic purposes. It can be found at the website URL: <http://www.wmo.ch/web/d dbs/publicat.html>. The contents for this publication are provided by WMO Members in a specified format and on a

routine basis. The publication is updated on the WMO website every 2-3 months (current publication is dated 29 Oct 2001). It provides basic information on observation program with some remarks on additional observations (e.g. geophysical, hydrological, etc.) and special services (e.g. Hurricane forecast centre, etc.). See sample in Table 1 shown below. Two code tables (A and B) are also available at the WMO Web site to be used (A) as a reference guide to the codes and symbols used in the data file and (B) to the footnote codes used. This publication does not provide information on stations' start, stop year, the years of record, or the specific type of instrumentation used. However, automatic stations are identified. A sample of the data format is given below.

Table 1. Sample of WMO Publication 9 Vol. A listing

Index Number	Name	Latitude	Longitude	Elev. HP	Elev. H/H	Surface Obs. 0	Surface Obs. 3	Surface Obs. 6	Surface Obs. 9	Surface Obs. 12	Surface Obs. 15	Surface Obs. 18	Surface Obs. 21	Obs.H Obs.S	Upper Air 0	Upper Air 6	Upper Air 12	Upper Air 18	Other Obs. and Remarks
71082P	ALERT, NWT	82 31N	62 16W		30	X	X	X	X	X	X	X	X	H00-23	.	.	.	.
71082P	ALERT UA, NWT	82 30N	62 20W	76	65	.	.	.	.	.	.	.	.		RW	.	RW	.	AUT;ICE;OZON E;SEISMO;
71042P	LUPIN CS, NWT	65 46N	111 13W		494	X	.	X	.	X	.	X	.	H00-23	.	.	.	.	AUT
71043P	NORMAN WELLS A, NWT	65 17N	126 48W	74	74	X	X*	X	X*	X	X*	X	X*	H00-23	.	.	.	.	A
71043P	NORMAN WELLS UA, NWT	65 17N	126 45W		95	.	.	.	.	.	.	.	.		RW	.	RW	.	AUT;EVAP;ICE; SNOW; SOLRA;SUNDUR;WN
71045P	PETESLIN, YT	60 10N	132 44W	711	705	X	X	X	X	X	X	X	X	H00-23	.	.	.	.	AUT
71050P	PUNTCI MOUNTAIN, BC	52 07N	124 08W		910	X	X	X	X	X	X	X	X	H00-23	.	.	.	.	AUT
71051P	SACHS HARBOUR, NWT	72 00N	125 16W		88	X	X	X	X	X	X	X	X	H00-23	.	.	.	.	AUT
71066P	HIGH LEVEL A, ALTA	58 37N	117 10W	338	338	X	X*	X	X*	X	X*	X	X*	H00-23	.	.	.	.	A:SUNDUR
71068P	PEACE RIVER A, ALTA	56 14N	117 26W	571	571	X	X*	X	X*	X	X*	X	X*	H00-23	.	.	.	.	A
71069P	SLAVE LAKE A, ALTA	55 17N	114 47W	583	583	X	X	X	X	X	X	X	X	H00-23	.	.	.	.	A
71076P	URANIUM CITY, SASK	59 34N	108 29W	316	318	X	X	X	X	X	X	X	X	H00-23	.	.	.	.	AUT
71077P	BUFFALO NARROWS, SASK	55 50N	108 26W	431	440	X	X	X	X	X	X	X	X	H00-23	.	.	.	.	AUT
71078P	LYNN LAKE, A, MAN	56 52N	101 05W	357	357	X	X*	X	X*	X	X	X*	X	H00-23	.	.	.	.	A:SNOW;SUNDUR

GPCC--ACSYS-APDA Data Catalogue contains listings of all stations (both active and inactive) within the Arctic Catchment Area defined by Vorosmarty, *et al* (1996). It includes climate, synoptic and drifting stations and provides basic station information on climate element, temporal resolution, length of record with start-stop dates, data quality and completeness of record. It does not provide information on station automation or instrumentation. This meta data catalogue can be found at the website URL: <http://www.dwd.de/research/gpcc/acsys/>. In addition to the meta the actual data sets are available to ACSYS project/scientist through the International ACSYS/CLIC Project Office (IACPO). This catalogue has not be updated since 20 Dec 1999 when the original funding ended, however, new 3-year funding has been found for this project and the catalogue should be updated soon. A sample of the data catalogue is shown in Table 2 below.

There are other sources for Arctic station data available, however they do not provide a convenient and comprehensive global listing of stations. Some contain more detail information on specific data and are useful for specific information. The GPCC website provides the best linkage to these other Arctic Data Sets. Their Linkage page can be found at the website URL: <http://www.dwd.de/research/gpcc/acsys/data.htm>. It lists 31 data sets with hyperlinks to 11 data source hompages.

Table 2. Sample listing of GPCC—ACSYS-ADPA meta data catalogue

The APDA station meta data catalogue apda_arctic.lst - 20 December 1999, GPCC/ACSYS_APDA																
WMO	NAT	LAT	LON	ELEV	RIV	A	C	T	FMFY	LMLY	RGP	HG	MSCQH	DS	NAME	REM
7254	6537	-13830	579	178	A P M	1971	1989	79	00000	GHCN OGILVIE RIVER, YT						
7268	6894	-13722	55	5319	A P M	1957	1989	86	00000	GHCN SHINGLE POINT A, YT						
7287	6093	-12922	724	14	A P M	1967	1989	94	00000	GHCN TUCHITUA, YT						
7289	6012	-12882	689	14	A P M	1938	1989	98	00000	GHCN WATSON LAKE A, YT						
7295	6822	-13500	7	178	A P M	1926	1989	59	00000	GHCN AKLAVIK A, NW						
7307	6893	-11692	18	2460	A P M	1957	1989	91	00000	GHCN CAPE YOUNG A, NW						
7309	6958	-12080	101	9999	A P M	1957	1989	97	00000	GHCN CLINTON POINT, NW						
7311	6548	-11037	451	382	A P M	1959	1981	99	00000	GHCN CONTWOYTO LAKE, NW						
7313	6782	-11513	22	306	A P M	1977	1989	92	00000	GHCN COPPERMINE A, NW						
7318	6023	-12347	213	14	A P M	1973	1989	92	00000	GHCN FORT LIARD A, NW						
7319	6743	-13488	30	178	A P M	1892	1977	58	00000	GHCN FORT MCPHERSON, NW						
7322	6492	-12557	98	14	A P M	1903	1988	60	00000	GHCN FORT NORMAN A, NW						
7323	6133	-11767	159	14	A P M	1943	1982	68	00000	GHCN FORT PROVIDENCE, NW						
7324	6272	-10917	164	14	A P M	1948	1989	97	00000	GHCN FORT RELIANCE, NW						
7325	6117	-11367	158	14	A P M	1911	1936	81	00000	GHCN FORT RESOLUTION, NW						
7326	6118	-11368	164	14	A P M	1930	1989	75	00000	GHCN FORT RESOLUTION A, NW						

WMO	WMO number	T	temporal resolution	QUAL	data quality flags
NAT	national number	D	daily data	YES=1, NO=0	
LAT	latitude [1/100 degr]	P	pentadal data	M data to make corrections of	
LONG	longitude [1/100 degr]	W	weekly data	system. measuring errors are	
ELEV	station elevation [1/1 m]	T	decadal data	available	
RIV	river catchment area number	M	monthly data	S corrections of system. measuring	
A	index, if station lies	FM	first month of time series	errors were made by source	
	within the Arctic catchment	FY	firts year of time series	C corrections of system. measuring	
C	climate element	LM	last month of time series	errors were made by APDA	
P	total precipitation	LY	last year of time series	Q GPCC quality control	
S	snow depth	RGP	ratio of data gap	H homogenization of time series	
L	liquid water content	HG	height of gauge above ground	was made	
	of snow cover		[1/10 m]	DS data source (abbreviation)	
F	total snowfall [mm]			NAME station name	
C	days with snow cover			REM remarks	
T	snow transect measurements				

Arctic Network Coverage

Figure 2 shows the areal coverage and distribution of all active synoptic stations from the WMO Publication No. 9 Vol. A catalogue and Figure 3 shows the subset of these stations using automatic measurements. The 50° N latitude was used as the Arctic boundary. Figure 4 presents a plot of the number of stations versus latitude. Figures 5 and 6 shows similar plots for all active upper air stations.

Figure 7 shows the areal coverage and distribution of the GPCC—ACSYS-ADPA catalogue synoptic stations within the Arctic Catchment area defined by Vorosmarty et al (1996). Figure 8 shows the common stations found in both the WMO Publication No. 9 Vol. A and the GPCC—ACSYS-ADPA catalogue. This station set consisting of 544 sites are all within the Arctic Catchment Area defined by Vorosmarty, *et al* (1996), they are all active as of 29 Oct 2001, and their historical data are available from GPCC/ADPA.

References

GPCC—ACSYS-ADPA website: •<http://www.dwd.de/research/gpcc/acsys/>

Vorosmarty, C.J., Meybeck, M., Fekete, B., 1996: Simulated network topology at 30-minute spatial resolution (STN-30) for world rivers. Global Hydrological Archive and Analysis System (GHAAS) digital data base (V. 2.4). Institute for the Study of the Earth, Oceans and Space, Univ. New Hampshire, Durham.

WMO Publication No. 9 Vol. A website: <http://www.wmo.ch/web/ddbs/publicat.html>

Figure 2. WMO Publication No. 9 Vol. A: All active synoptic stations north of 50° N Latitude as of 29 Oct 2001.

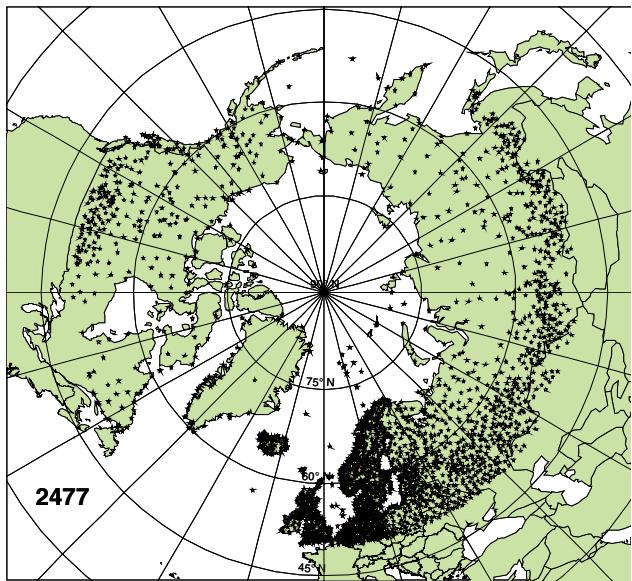


Figure 3. WMO Publication No. 9 Vol. A: All active synoptic stations north of 50° N Latitude with automatic measurements as of 29 Oct 2001.

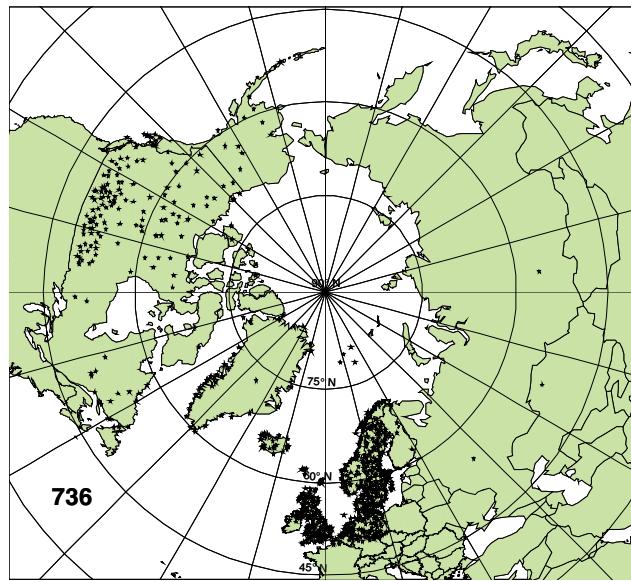


Figure 4. Number of active synoptic stations versus Latitude in Northern Hemisphere (WMO Publication No. 9 Vol. A, 29 Oct 2001)

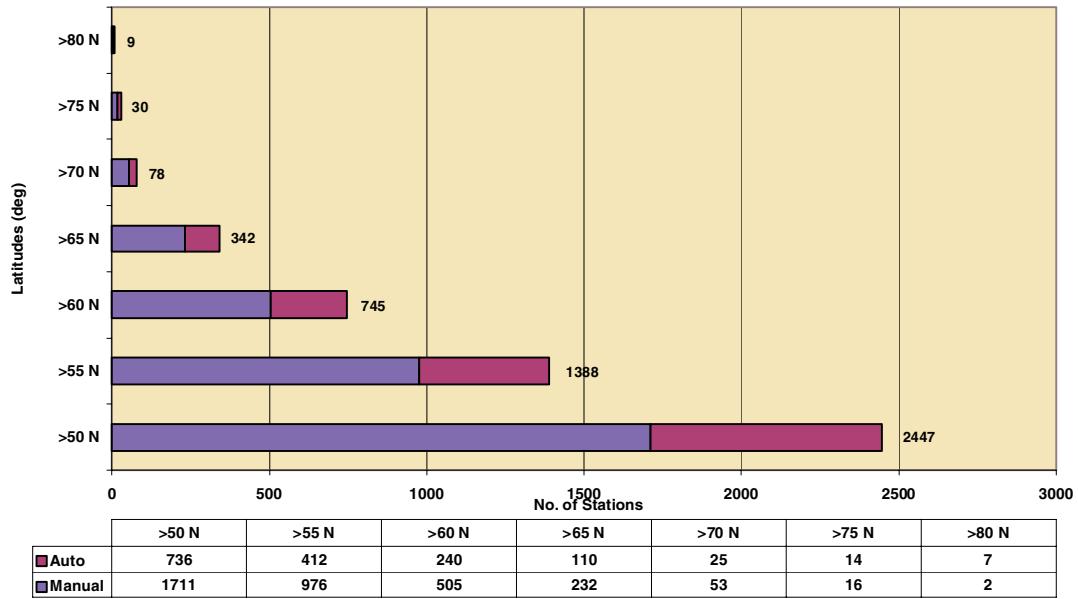


Figure 5. WMO Publication No. 9 Vol. A: All active upper air stations north of 50° N Latitude as of 29 Oct 2001.

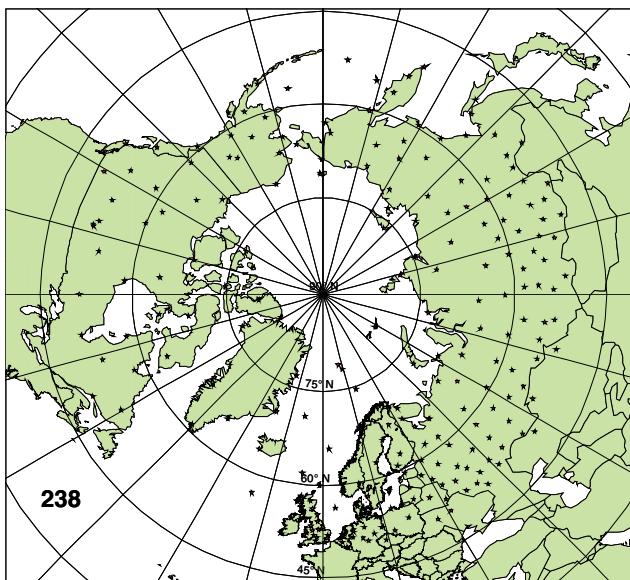


Figure 6. Number of active upper air stations versus Latitude in Northern Hemisphere (WMO Publication No. 9 Vol. A, 29 Oct 2001)

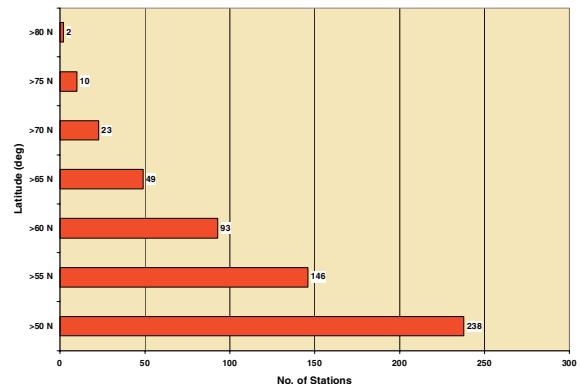


Figure 7. GPCC—ACSYS-ADPA(20 Dec 1999): All synoptic stations in catalogue within the Arctic Catchment area defined by Vorosmarty et al (1996).

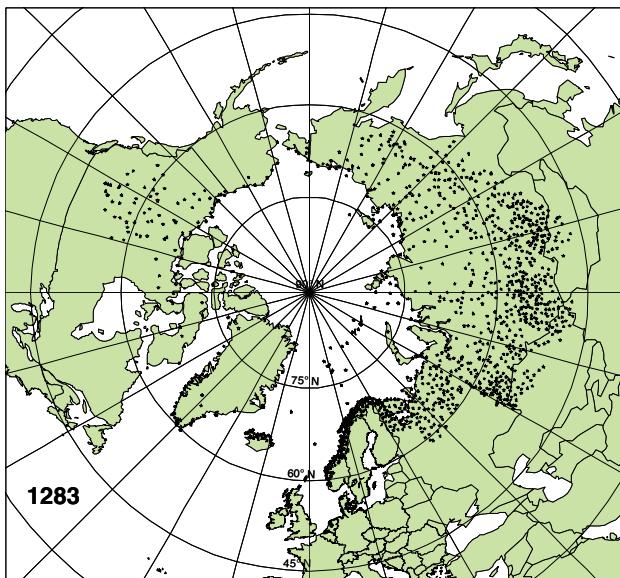


Figure 8. WMO and GPCC—ACSYS-ADPA common synoptic stations.

